SOUTH FORK NEWAUKUM RIVER BRIDGE **HAER No. WA-112**
State Route 508 spanning South Fork Newaukum River
Onalaska vicinity
Lewis County
Washington

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

PHOTOGRAPHS

HISTORIC AMERICAN ENGINEERING RECORD
NATIONAL PARK SERVICE
DEPARTMENT OF THE INTERIOR
P.O. BOX 37127
WASHINGTON, D.C. 20013-7127

HAER
WASH
21-ONAL.V
1-

HISTORIC AMERICAN ENGINEERING RECORD

SOUTH FORK NEWAUKUM RIVER BRIDGE

HAER No. WA-112

Location:	State Route 508, spanning the South Fork Newaukum River, 6.2 miles east of Onalaska, Onalaska Vicinity, Lewis County, Washington, beginning at mile point 13.65. UTM: 10/512620/5157880 Quad: Onalaska, Washington
Date of Construction:	1930
Engineer:	Designed by Roy L Green, Lewis County Engineer.
Fabricator:	Creech Bros., Aberdeen, WA., contractor. Star Iron & Steel Company, Tacoma, WA. fabricator.
Owner:	Originally Lewis County. By at least 30 July 1941, Washington Department of Highways. From 1977, Washington State Department of Transportation, Olympia, Washington.
Present Use:	Vehicular and pedestrian traffic.
Significance:	A good, virtually unaltered example of a riveted Pony Warren Truss with verticals. The design may have been based on one of the standard bridge designs developed by the Washington Department of Highways from 1920.
Historian:	Jonathan Clarke, August 1993.

History of the Bridge

On 11 January 1930, Lewis County first announced to prospective contractors their intention to build a small bridge over the South Fork of the Newaukum River. Notice of this appeared in the *Pacific Builder and Engineer*. It specified that plans were being prepared by the county engineer, Roy L. Greene for a 90′ steel bridge, 20′ wide; the contract was to be let about the first of April for an estimated $15,000.[1] The construction of the Bridge was to form part of an improvement program on two county roads, the Frank Purnell Road and the Bear Canyon Road. Included in the contract was the construction of concrete piers and 107′ of creosoted pile trestle approaches with a concrete deck. Bids for the contract opened on 14 April 1930, and the contract was awarded to Creech Bros., Aberdeen, Washington. At $15,989, this company's bid was the lowest out of the seven competing contractors: two bids were a little over $20,000.[2] The bridge was completed at some point by the end of the year.[3] The Star Iron and Steel Company of Tacoma supplied the materials.[4]

Design and Description

The South Fork Newaukum River Bridge consists of one 90′ Riveted Pony Warren Truss with verticals, and a six-span and a one-span treated timber pile trestle approach, giving an overall length of 196′. The concrete piers supporting either end of the truss and the ends of the approach spans are of the dumbbell type, two columns connected by a web wall. The connection between the ends of the lower chord and the west and east pier tops is, respectively, formed by a cast steel pedestal, and a cast steel roller nest. The former resists the lateral thrust of the structure caused by thermal expansion, whilst the latter is designed to accommodate it.

The steel truss is not of a "true" Warren configuration, in that the web triangles are not equilateral. This was frequently the case with triangular truss types, for there was no structural advantage in making the web triangles equilateral.[5] It is a remarkably simple structure, composed of a parallel upper and lower chord connected by five vertical and, including the inclined end posts, six diagonal members. Each of the six panels is 15′ long. Two intersecting diagonals in each panel make up the bottom lateral bracing. The top chord acts in compression, whilst the diagonals carry both the compressive and tensile forces acting within the truss. The verticals serve as bracing for the triangular web system formed by the diagonals. The lower chord is in compression.

The upper chord is made up of six composite members, each comprising two 10" rolled channels, riveted together on the

outside of the flanges with a 15" x 5/16" cover-plate. The lower chord also comprises of six built up members, made up of two angles measuring 6" x 4", riveted to an 8" plate. The steel used for both these components is thicker for the central two panels (L2-L3; L3-L4) on account of the greater tensile forces acting there: the angles are made from 3/4" steel and the plates from 9/16" steel, compared to 3/8" and 7/16" respectively for the outer panels (L0-L2; L4-L6). The diagonals are made up of four angles measuring 3-1/2" x 2-1/2", connected on the outside of the flanges by lacing, so that this is sandwiched between them. Because of the relatively greater compressive and tensile forces the central panel diagonals have to sustain, the angles are rolled from marginally thicker steel: 5/16" thick for diagonals L2-U3 and U3-L4 compared to 3/8" thick for the other diagonals. The verticals are more slender than the diagonals because they only act in tension. They are made up of two angles, connected by narrow batten plates, and measure 3-1/2" x 3" x 1/2" for those between points U1-L1; U3-L3 and U5-L5; and 3-1/2" x 2-1/2" x 5/16" for those connecting U2-L2 and U4-L4. A single 3" x 2-1/2" x 5/16" angle is used for the diagonals making up the bottom lateral bracing. Either truss "wall" is given additional support by slender cantilever brackets positioned parallel to the verticals. Gusset plates are used to connect all the various members at panel points. Three-quarter-inch diameter rivets are used throughout the truss.

Seven rolled-steel I-beams at 15′ spacing, each with a 24" web and 22′-3" span, support seven lines of stringers, resting on seat angles. The stringers are rolled I-section beams, and have a 14" web. They each have a span of 15′ and are spaced 3′-4" apart. These in turn provide the support for a 6" thick reinforced concrete deck and 8" high reinforced concrete curbs. A 3′-5" latticed road rail offers some protection to the horizontals and diagonals from vehicular collision. No sidewalk is provided beside the narrow roadway, which is 20′ between curbs.

The employment of Pony trusses for short spans was a common practice in the late nineteenth century and early twentieth century, but not one that was agreeable to all bridge engineers. John Alexander Low Waddell, a renowned bridge engineer working in this period objected "most vigorously" to their use, maintaining that "under no circumstances [was] it necessary to build them." His main objection was that for short spans, plate-girder spans provided a safer alternative: the determination of the ultimate strength of the partially unsupported top chords of Pony trusses was approximate at best.[6] Nevertheless, their use remained widespread, and when used in a Warren or Pratt configuration, proved particularly cost effective, because they required only a limited range of shop parts.

This bridge may have been built to the standard design for short/medium span highway bridges developed by the Washington Department of Highways. From 1920 the agency began a policy of standardizing bridge plans as much as possible, so that their preparation and the accompanying estimates for particular situations could be expedited at comparably less cost. It also reduced the amount of unnecessary duplication in design. Smaller spans naturally lent themselves to this process more easily, but by 1920-22, three longer spans of 90′ upwards had been prepared. These were all steel trusses, and were designed in lengths of 90′, 130′, 140′, and 240′. All were designed with 20′ clear roadways between curbs, which permitted the passing of three automobiles in an emergency, and all conformed to "class A" loading, meaning they were capable of supporting a moving 20-ton truck and an impact allowance of 15 percent on top of this. The smallest of these spans was provided by 90′ pony truss with a concrete floor. By 1922-24, the counties were at liberty to use all of these designs at no cost.[7] It is thus plausible that whilst Roy L. Greene, the county engineer, "prepared the plans" for this bridge, This work may have involved the design of the approaches, etc., and not the bridge itself.[8]

Repair and Maintenance

The South Fork Newaukum River Bridge has remained in good overall condition throughout its life-span to date. The main areas of concern that have required some attention are the concrete curbs, deck surfacing, rails, truss members, and piles.

The first Washington Department of Highways' Bridge Inspection Report for the South Fork Newaukum River Bridge, in 1946, noted considerable exfoliation and spalling of the curbs. By 1953 some 15′-20′ of reinforcing bar was exposed: in 1958 seven sections of curb were replaced. In 1979 repair of the curbs was again required, since it was noted that some 10′ of reinforcing bar was hanging loose. The damaged sections were replaced in 1981. The problem, albeit less dramatically, re-emerged four years later, and presumably only on those older sections that had not been previously replaced. No action on this had been taken by 1991, the last available report.

By 1957 it was apparent that the asphalt concrete deck was in need of resurfacing because of extensive scaling. This was undertaken in 1964, although the extent of this is unclear for in 1969 transverse leaching cracks were noted. The situation deteriorated still further by 1977, with the appearance of pattern cracking and potholes. In 1986 the condition was still noted.

The condition of the approach rails was noted throughout the late 1940s and early 1950s as being poor: in particular seven posts were rotten and weak. New treated timber rails were installed in 1955.

The inclined end post of the northwest end of the truss suffered a minor collision in 1951 or 1952 which bent the lower flange upwards by some 2" and the web inward approximately half an inch. In 1957 a slight bend in the diagonal U1-L2 at the same end of the truss was noted. The former problem was not deemed sufficient to warrant repair, whilst the latter was finally taken care of by 1971.

The last problem, that of the piers, is also the most recent. In the early 1980s, progressive erosion of the bank was noted as having scoured away the pile foundations of the west bent, next to the steel truss, exposing some 4' of pile shaft. Drift accumulation was exacerbating the situation: this was removed and a rock rip-rap was constructed on the stream bank to protect the piles. Some of the piles on this trestle were also noted as having center rot and splitting. In 1986, following flood damage, four new treated timber piles were driven in at the first bent west of the steel span, and cross bracing was installed.[9]

Data Limitations

This bridge received no coverage in the engineering literature. The *Engineering Index* made no mention of it, whilst a perusal through the two more regional engineering journals--the *Pacific Builder and Engineer* and *Western Construction News* for the year 1930 yielded only limited contractual information from the former (see bibliography). This journal is available for immediate consultation in Seattle Public Library.

Regarding construction of the historical context of the bridge, the Department of Highways *Biennial Report* provided some useful information. No newspaper article citations were found in the card indexes of either the Northwest Room of the Washington State Library, Olympia, the Washington State Historical Society, Tacoma, or the Lewis County Historical Society, Chehalis. One potential source of information that was not tried because of time limitations were Commissioners Reports, etc., at Lewis County Courthouse.

The (incomplete) set of plans held on microfilm at Records Control, Washington State Department of Transportation Building, Olympia, Washington, together with the annual inspection information held on file at the Bridge Preservation Section, Washington State Department of Transportation, Olympia, proved particularly useful in describing the structure.

Project Information

This project is part of the Historic American Engineering Record (HAER), National Park Service. It is a long-range program to document historically significant engineering and industrial works in the United States. The Washington State Historic Bridges Recording Project was co-sponsored in 1993 by HAER, the Washington State Department of Transportation (WSDOT), and the Washington State Office of Archeology & Historic Preservation. Fieldwork, measured drawings, historical reports, and photographs were prepared under the general direction of Robert J. Kapsch, Ph.D., Chief, HABS/HAER; Eric N. DeLony, Chief and Principal Architect, HAER; and Dean Herrin, Ph.D., HAER Staff Historian.

The recording team consisted of Karl W. Stumpf, Supervisory Architect (University of Illinois at Urbana-Champaign); Robert W. Hadlow, Ph.D., Supervisory Historian (Washington State University); Vivian Chi (University of Maryland); Erin M. Doherty (Miami University), Catherine I. Kudlik (The Catholic University of America), and Wolfgang G. Mayr (U.S./International Council on Monuments and Sites/Technical University of Vienna), Architectural Technicians; Jonathan Clarke (ICOMOS/Ironbridge Institute, England) and Wm. Michael Lawrence (University of Illinois at Urbana-Champaign), Historians; and Jet Lowe (Washington, D.C.), HAER Photographer.

SELECTED BIBLIOGRAPHY

Boone, J. W. "County Highway: Bids Close April 14, Chehalis, Wn. [Advertisement for Bids]." *Pacific Builder and Engineer*, 22 March 1930, 11

Comp, T. Allen, and Donald C. Jackson. *Bridge Truss Types: A Guide to Dating and Identifying*. Technical Leaflet Series, no. 95. Nashville: American Association for State and Local History, 1977.

Condit, Carl W. "American Building Art: The 20th Century." New York: Oxford University Press, 1961.

Corning, Howard McKinley, ed., The New Washington: A Guide to the Evergreen State. Revised Edition. American Guide Series. Portland: Binfords & Mort, 1950.

Greene, Roy L. "Wn, Chehalis - Ready for Bids Abt March 1 - County Bridge." [Notice of impending bids]" *Pacific Builder and Engineer*, 11 January 1930, 7.

Greene, Roy L. "Wn, Chehalis - Contr - County Bridge." [Notice of Award]" *Pacific Builder and Engineer*, 19 April 1930, 36.

Jackson, Donald C. *Great American Bridges and Dams*. Washington: The Preservation Press, 1988.

[Soderberg, Lisa] HAER Bridge Inventory--South Fork Newaukum River Bridge. Held by Washington State Office for Archaeology and Historic Preservation, Olympia, WA.

Star Iron & Steel Company, Tacoma, Washington. "Lewis Co. Bridge #68 [Shop drawings]." Held by Records Control, Washington State Department of Transportation, Olympia, WA.

Waddell, J. A. L. *Bridge Engineering*. Volume 1. New York:John Wiley & Sons, 1916.

Washington. State Department of Transportation. Bridge Preservation Section. Bridge Files.

ENDNOTES

[1] Roy L. Greene, "Wn, Chehalis-Ready for Bids Abt March 1-County Bridge." [Notice of impending bids]," *Pacific Builder and Engineer*, 11 January 1930, 7.

[2] Roy L. Greene, "Wn, Chehalis-Contr-County Bridge [Notice of Award]," *Pacific Builder and Engineer*, 19 April 1930, 36; J. W. Boone, "County Highway: Bids Close April 14, Chehalis, Wn. [Advertisement for Bids]," *Pacific Builder and Engineer*, 22 March 1930, 11.

[3] "Newaukum River (South Fork) No. 508/12," Kardex Card File, Bridge Preservation Section, Washington State Department of Transportation, Olympia, WA [WSDOT]. This gives the construction date as 1930, but the actual completion date (month/day) is not available.

[4] Ibid.

[5] J. A. L. Waddell, *Bridge Engineering*, vol. 1 (New York: John Wiley & Sons, 1916), 472.

[6] Ibid., 468, 479.

[7] Washington Department of Highways, *Ninth Biennial Report of the Supervisor of Highways, 1920-1922*, 31-33; Washington Department of Highways, *Tenth Biennial Report of the Supervisor of Highways, 1922-1924*, 32-33.

[8] Greene, "Wn, Chehalis-Ready for Bids Abt March 1-County Bridge." [Notice of impending bids]," 7.

[9] "Newaukum River (South Fork), No. 508/12," Bridge Inspection Reports (1947-1991), Bridge Preservation Section, WSDOT.